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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
THOMAS NARBESHUBER, ET AL. : EXAMINER: Y. VALENROD  
SERIAL NO: 10/538,473 :  
FILED: JUNE 7, 2005 : GROUP ART UNIT: 1621  
FOR: PROCESS FOR THE PREPARATION OF ALKYLARYLSULFONATES BY  
MEANS OF MODIFIED, DIMERIZED OLEFINS

APPEAL BRIEF

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal from the Final Rejection of the claims dated November 23, 2007.

I. REAL PARTY IN INTEREST

The real party in interest is BASF SE.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and their assignee are not aware of any appeals or interferences which will directly affect or be directly affected by or having a bearing on the Board's decision in this appeal.

### III. STATUS OF THE CLAIMS

The appealed claims are Claims 8 and 10-14, the only claims in the case.

### IV. STATUS OF AMENDMENTS

An Amendment and Request for Reconsideration was filed on February 25, 2008.

The Examiner informed the undersigned by telephone on July 22, 2008, that the amendment has been entered.

### V. SUMMARY OF THE CLAIMED SUBJECT MATTER

As set forth in Claim 8, the present invention relates to a process for the preparation of alkylarylsulfonates {see page 1, line 7 of the specification} by

a) reaction of a C<sub>4</sub>-olefin mixture over a metathesis catalyst to prepare an olefin mixture comprising 2-pentene and/or 3-hexene, and optional removal of 2-pentene and/or 3-hexene {see page 3, lines 19-21 of the specification},

b) dimerization of the 2-pentene and/or 3-hexene obtained in stage a) in the presence of a dimerization catalyst to give a mixture comprising C<sub>10-12</sub>-olefins, removal of the C<sub>10-12</sub>-olefins and removal of 5 to 30% by weight, based on the C<sub>10-12</sub>-olefins removed, of low-boiling constituents of the C<sub>10-12</sub>-olefins, such that at least 90% of di- or poly-branched olefins are separated off {see page 3, line 23-26 of the specification},

c) reaction of the C<sub>10-12</sub>-olefin mixtures obtained in stage b) with an aromatic hydrocarbon in the presence of an alkylation catalyst to form alkyl aromatic compounds, where, prior to the reaction, 0 to 60% by weight, based on the C<sub>10-12</sub>-olefin mixtures obtained in stage b), of linear olefins may additionally be added {see page 3, lines 28-32 of the specification},

d) sulfonation of the alkyl aromatic compounds obtained in stage c) and neutralization to give alkylarylsulfonates, where, prior to the sulfonation, 0 to 60% by weight, based on the alkyl aromatic compounds obtained in stage c), of linear alkylbenzenes may additionally be added, if no admixing has taken place in stage c) {see page 3, line 34 to page 4, line 2 of the specification},

e) optional mixing of the alkylarylsulfonates obtained in stage d) with 0 to 60% by weight, based on the alkylarylsulfonates obtained in stage d), of linear alkylarylsulfonates, if no admixing has taken place in stages c) and d) {see page 3, lines 4-6 of the specification}.

## VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The sole issue on appeal is whether Claims 8 and 8-14 are unpatentable under 35 U.S.C. §103(a) over Maas et al. (U.S. 2004/0010161 A1) in view of Scheibel et al. (WO 99/05241).

## VII. ARGUMENT

As set forth in Claim 8, the present invention relates to a process for the preparation of alkylarylsulfonates. An important aspect of the claimed process is the removal of 5 to 30% by weight, based on the C<sub>10-12</sub>-olefins removed, of low-boiling constituents of the C<sub>10-12</sub>-olefins, such that at least 90% of di- or poly-branched olefins are separated off.

The Office recognizes that Maas et al. fail to disclose removal of 5 to 30% by weight, based on the C<sub>10-12</sub>-olefins removed, of low-boiling constituents of the C<sub>10-12</sub>-olefins, such that at least 90% of di- or poly-branched olefins are separated off as specified in Claim 8. See page 3 of the Office Action dated November 23, 2007.

Scheibel et al. disclose cleaning products comprising improved alkylaryl sulfonate surfactants prepared via vinylidene olefins and processes for preparation thereof. According to page 1, second paragraph, highly branched alkylbenzene sulfonate surfactants are used in detergents, and these were found to be very poorly biodegradable. In addition, linear alkylbenzene sulfonates are not without limitations, for example, they would be more desirable if improved for hard water and/or cold water cleaning properties. Therefore, a person of ordinary skill in the art would learn from this reference that highly branched alkylbenzene sulfonate surfactants as well as linear alkylbenzene sulfonates are not perfect compounds being present in surfactant compositions.

According to the last paragraph on page 6 of Scheibel et al., “modifying an alkylaryl sulfonate surfactant by *reducing* linearity or “delinearization”, is effectively provided for in the process according to Scheibel et al. Further in this paragraph it is stated that the essence in the invention according to Scheibel et al, is the notion that linearity reduction is processed by use of vinylidene olefins, especially when combined with a particular type of alkylation.”

Therefore, a person of ordinary skill in the art learns from Scheibel et al. that branched alkylarylsulfonate surfactants are preferred, and that a process for *delinerization* is provided. This process according to Scheibel et al. comprises step (a) a dimerization step, comprising reacting, in the presence of the dimerization catalyst, an olefinic feed stock comprising  $\alpha$ -olefins or mixtures thereof to form one or more vinylidene olefins having a carbon content of from 10 to 16 carbon atoms, see page 4, 4<sup>th</sup> paragraph. According to page 7, last paragraph, the opportunity to achieve a meaningful improvement by delinearization or branching in alkylbenzene sulfonate surfactants can be (i) selecting the feed stock wherein  $\alpha$ -olefins consist essentially of a ternary mixture of  $\alpha$ -olefins having 5 to 7 carbon atoms. According to page 8, second paragraph, the delinearized olefins according to Scheibel et al.

are obtained by conducting the preparation steps without separation or extraction of said vinylidene olefins from oligomers,

The teaching of Scheibel et al. is that highly branched alkylarylsulfonate surfactants having improved characteristics can be obtained by a process comprising the dimerization of  $\alpha$ -olefins, being olefins having the double bond in 1-position, in order to obtain dimerization products being olefins having vinylidene groups present in the alkyl chain. A proof for this can also be found on page 23 of the description of the present application, where it is stated that  $\alpha$ -olefins selectively react to vinylidenes, see lines 19 to 26 of page 23. This is in accordance with the teaching of Scheibel et al.

Further alkylation of aromatic compound with these vinylidene containing compounds according to Scheibel et al. gives rise to alkylaryl compounds having a high degree of branching, which, as discussed above, is advantageous according to Scheibel et al. The last step according to Scheibel et al. is sulfonation of these alkylaryl compounds.

In addition, in Scheibel et al. it is disclosed that a high amount of molecules are obtained that are arylated at terminal positions. According to page 23 of Scheibel et al., the Internal Isomer Selectivity (IIS) is 0 to 40, preferably 0 to 10, which means compounds being arylated at internal positions are present in an amount of 0 to 40%, preferably 0 to 10%, which further means that compounds being arylated at terminal positions are present in an amount of at least 60%, preferably at least 90%. A person of ordinary skill in the art would therefore learn from Scheibel et al. that the use of  $\alpha$ -olefins gives rise to dimerization products having vinylidene groups which further give rise to aryl alkanes that are arylated predominantly at terminal positions.

The contrast between the teaching of Scheibel et al. and the process according to Claim 8 of the present application is that step b) according to the present application comprises the dimerisation of 2-pentene and/or 3-hexene obtained in stage a), 2-pentene and 3-hexene are not  $\alpha$ -olefins, as taught by Scheibel et al. Therefore, dimerization of these olefins having the double bond in an internal position, does not give rise to dimerization products being olefins having at least one vinylidene group in the molecule. This contrast between Scheibel et al. and the process according to Claim 8 of the present application provides that the amount of terminally arylated compounds does not exceed 50%. According to page 1, line 28 to page 2, line 3 of the description, the amount of 2-phenyl alkanes is about 30%, and the amount of 2- and 3-phenyl alkanes is about 50%. In addition, if the amount of terminal aryl alkanes is excessively high which means higher than 50%, the processability of these products suffers as a result of a large increase in the viscosity of the sulfonates.

Further, in contrast to Scheibel et al., an even higher amount of linear alkylaryl compounds, C<sub>10-12</sub>-olefin being low boiling constituents are removed after the dimerization step, in order that at least 90% of the di- or polybranched olefins are separated off. This additional step causes that compounds are obtained that show an improved biodegradability, because di- and polybranched olefins are removed which would cause a low biodegradability.

The process according to the present application therefore give rise to compounds which differ from the ones according to Scheibel et al. in at least two ways.

First, the amount of terminally arylated compounds is restricted to about 50% caused by the use of 2-pentene and/or 3-hexene as starting olefins, whereas Scheibel et al. use  $\alpha$ -olefins which end up in aryl compounds having an amount of terminal isomers of at least 60%, preferably at least 90%. As a consequence thereof the compounds according to the present invention show an improved processability.

Second, at least 90% of di- or polybranched compounds are separated of in the process according to the present invention, causing an improved biodegradability of these compounds.

Further, according to page 24, lines 20 and following of the description, the specific mixture of olefins obtained in stop b) is arylated in step c). According to lines 23 and 26, this olefin mixture has an optimum structure/linearity in respect of the degree and the type of branching, in order to obtain advantageous alkyl aromatic compounds in stage c).

The characteristic process according to Claim 8 of the present application therefore gives rise to compounds having an advantageous combination of features as explained above, being improved processability and improved biodegradability.

A person of ordinary skill in the art looking for a process to such improved linear alkylaryl compounds which can further be sulfonated, would obtain from the teaching by Scheibel et al., that  $\alpha$ -olefins shall be dimerized in order to obtain olefins having vinylidene groups. In addition, the such a person would conclude that these vinylidene-containing olefins give rise to advantageous highly branched alkylaryl compounds, which, in turn, give rise to advantageous alkylaryl sulfonate surfactants. Thus, a person of ordinary skill in the art would not conclude from Scheibel et al. that olefins having internal double bonds like 2-pentene and/or 3-hexene should be used in order to get predominantly linear compounds. A person of ordinary skill in the art also would not conclude that terminal aryl alkanes shall be present in an amount of about 50% but not more, because Scheibel et al. teach an amount of at least 50%, preferably at least 90%.

In addition, a person of ordinary skill in the art would not conclude from the teaching from Scheibel et al to remove di- or polybranched C<sub>10-12</sub>-olefins from the mixture obtained in the dimerization step, because the reference teaches that these compounds are the preferred olefins. Therefore, Scheibel et al. cannot point in the direction that these compounds shall be removed, in order to improve biodegradability.

Therefore, a person of ordinary skill in the art would have from Scheibel et al. the teaching of or the motivation for removing di- or polybranched compounds, because according to that reference, these compounds are the preferred ones and should not be separated off.

In view of the foregoing, the combination of Maas et al. and Scheibel et al. fails to suggest the process specified in Claim 8. Accordingly, reversal of this rejection is respectfully requested.

Claim 10 depends from claim 8 and further specifies that the metathesis catalyst in stage a) is chosen from compounds of a metal of group VIb, VIIb or sub-group VIII of the Periodic Table of the Elements. Since the combination of Maas et al. and Scheibel et al. fails to suggest the process specified in Claim 8, those references certainly fail to suggest the process recited in Claim 10.

Claim 11 depends from claim 8 and further specifies that, in stage b), a dimerization catalyst is used which comprises at least one element of sub-group VIII of the Periodic Table of the Elements. Since the combination of Maas et al. and Scheibel et al. fails to suggest the process specified in Claim 8, those references certainly fail to suggest the process recited in Claim 11.



Claim 12 depends from claim 8 and further specifies that the dimer olefin mixtures obtained in stage b) have an average degree of branching in the range from 1 to 2.5. Since the combination of Maas et al. and Scheibel et al. fails to suggest the process specified in Claim 8, those references certainly fail to suggest the process recited in Claim 12.

Claim 13 depends from claim 8 and further specifies that the dimer olefin mixtures obtained in stage b) have an average degree of branching in the range from 1 to 2.0. Since the combination of Maas et al. and Scheibel et al. fails to suggest the process specified in Claim 8, those references certainly fail to suggest the process recited in Claim 13.

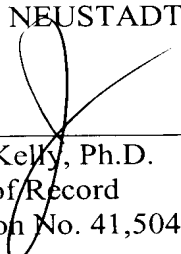
Claim 14 depends from claim 8 and further specifies that, in stage c), an alkylation catalyst is used which leads to alkyl aromatic compounds which have 1 to 3 carbon atoms with a H/C index of 1 in the alkyl radical. Since the combination of Maas et al. and Scheibel et al. fails to suggest the process specified in Claim 8, those references certainly fail to suggest the process recited in Claim 14.

In view of the foregoing, Claims 8 and 9-14 are not obvious over the combination of s. Accordingly, that ground of rejection should be reversed.

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Respectfully submitted,

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## CLAIMS APPENDIX

The appealed claims read as follows:

8. A process for the preparation of alkylarylsulfonates by

a) reaction of a C<sub>4</sub>-olefin mixture over a metathesis catalyst to prepare an olefin mixture comprising 2-pentene and/or 3-hexene, and optional removal of 2-pentene and/or 3-hexene,

b) dimerization of the 2-pentene and/or 3-hexene obtained in stage a) in the presence of a dimerization catalyst to give a mixture comprising C<sub>10-12</sub>-olefins, removal of the C<sub>10-12</sub>-olefins and removal of 5 to 30% by weight, based on the C<sub>10-12</sub>-olefins removed, of low-boiling constituents of the C<sub>10-12</sub>-olefins, such that at least 90% of di- or poly-branched olefins are separated off,

c) reaction of the C<sub>10-12</sub>-olefin mixtures obtained in stage b) with an aromatic hydrocarbon in the presence of an alkylation catalyst to form alkyl aromatic compounds, where, prior to the reaction, 0 to 60% by weight, based on the C<sub>10-12</sub>-olefin mixtures obtained in stage b), of linear olefins may additionally be added,

d) sulfonation of the alkyl aromatic compounds obtained in stage c) and neutralization to give alkylarylsulfonates, where, prior to the sulfonation, 0 to 60% by weight, based on the alkyl aromatic compounds obtained in stage c), of linear alkylbenzenes may additionally be added, if no admixing has taken place in stage c),

e) optional mixing of the alkylarylsulfonates obtained in stage d) with 0 to 60% by weight, based on the alkylarylsulfonates obtained in stage d), of linear alkylarylsulfonates, if no admixing has taken place in stages c) and d).

10. The process as claimed in claim 8, wherein the metathesis catalyst in stage a) is chosen from compounds of a metal of group VIb, VIIb or sub-group VIII of the Periodic Table of the Elements.

11. The process as claimed in claim 8, wherein, in stage b), a dimerization catalyst is used which comprises at least one element of sub-group VIII of the Periodic Table of the Elements.

12. The process as claimed in claim 8, wherein the dimer olefin mixtures obtained in stage b) have an average degree of branching in the range from 1 to 2.5.

13. The process as claimed in claim 8, wherein the dimer olefin mixtures obtained in stage b) have an average degree of branching in the range from 1 to 2.0.

14. The process as claimed in claim 8, wherein, in stage c), an alkylation catalyst is used which leads to alkyl aromatic compounds which have 1 to 3 carbon atoms with a H/C index of 1 in the alkyl radical.

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# EVIDENCE APPENDIX

None.

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RELATED PROCEEDINGS APPENDIX

None.